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BOARD OF PUBLIC WORKS

OF JERSEY CITY, N. J.

ANNUAL REPORT

OF THE

CHIEF ENGINEER,

For Year ending December 31, 1877.

PRESENTED JANUARY 22, 1878

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1877

BOSFORD & SONS, PRINTERS AND STATIONERS, 56 CEDAR ST., N. Y.
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BOARD OF PUBLIC WORKS

OF JERSEY CITY, N. J.

ANNUAL REPORT

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PRESENTED JANUARY 22, 1878

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REPORT.

BUREAU OF ENGINEERING AND SURVEYING, }
OFFICE OF CHIEF ENGINEER, }

JERSEY CITY, January 1st, 1878.

To the Honorable the Board of Public Works :—

GENTLEMEN—The pumping engines at Belleville have altogether during their operation consumed 12,698 hours and 12 minutes of time during the past year. They have made 8,712,181 strokes, raised 636,102,454 cubic feet of water to an average height of one hundred and sixty-one and one-half feet, and consumed 5,518 tons of coal, of which 338 tons were used for banking fires. 782 tons of clinkers and ashes have been removed from the ash pits.

The following tables exhibit the monthly record of the duty of each engine from January 1st, 1871, up to the present time.

DUTY OF CORNISH ENGINE, No. 1.

Area of Plunger 982.1 sq. in. Length of Stroke, 10.5 lin. ft. Load on Engine, 67,850.0 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Boiling Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1871									
February.	160	40	99,236	138,100	70,000	37,851	100,249	508,160	700,020
March.....	117	5	71,661	97,000	22,300	25,848	71,152	522,440	712,230
April.....	161	10	98,799	137,700	17,000	32,841	104,859	507,390	666,310
June.....	154	..	95,625	130,900	6,000	22,900	108,000	516,610	626,140
July.....	184	35	117,199	159,000	9,200	12,528	146,472	521,260	565,840
August.....	153	5	107,090	145,300	8,000	12,195	133,105	521,210	568,960
September.	109	5	68,647	95,800	2,100	4,621	91,179	506,740	532,420
October....	87	15	53,488	79,500	2,000	11,989	67,511	475,790	573,340
December.	182	30	111,619	154,200	20,200	27,158	127,042	511,890	621,320
Totals	1,309	25	823,364	1,137,500	156,800	187,931	949,569	511,880	613,190
1872									
January..	224	5	137,776	196,800	32,200	40,812	155,988	493,940	624,610
February..	241	5	147,194	200,800	27,200	38,456	162,350	518,390	641,160
March.....	244	15	143,285	194,400	30,200	36,900	157,500	520,030	641,870
April.....	50	10	29,677	42,000	14,800	3,600	38,400	499,690	546,530
May.....	253	10	153,992	221,100	34,800	47,900	176,200	485,940	618,040
June.....	229	..	148,340	205,200	37,300	48,400	156,860	511,220	669,020
July.....	117	..	76,956	114,600	21,700	19,400	95,200	474,880	571,650
September	105	5	66,661	84,700	17,700	13,800	70,900	556,560	664,890
October....	239	25	169,230	195,800	38,200	28,500	167,300	611,210	713,690
November.	269	35	173,412	222,900	43,500	32,000	190,900	550,170	642,390
December.	301	..	173,849	254,700	42,300	33,500	221,200	482,690	555,790
Totals.....	2,273	50	1,420,372	1,936,000	339,900	343,262	1,592,738	518,830	630,640
1873									
January..	324	10	209,094	304,100	29,400	42,500	261,600	486,240	565,240
February..	322	35	217,331	308,000	39,400	43,300	264,700	499,000	580,490
Totals....	646	45	426,425	612,100	68,800	85,800	526,300	492,660	572,980
1875									
January..	1	10	665	1,800	.....	.....	.....	261,260	.....
February.	19	15	8,556	13,680	4,845	3,300	10,380	442,290	574,910
March.....	188	5	102,330	189,090	16,875	36,200	152,890	382,700	473,320
April.....	401	50	246,870	429,540	21,945	87,500	342,040	406,440	510,410
May.....	404	45	229,963	263,975	4,845	63,500	200,475	616,060	813,060
June.....	85	35	46,025	72,105	10,260	18,100	54,005	451,390	602,680
July.....	14	45	9,096	12,825	3,135	3,000	9,825	502,710	654,700
August....	7	10	3,994	6,270	855	1,200	5,070	450,470	557,090
September	10	35	6,477	8,835	570	2,100	6,735	518,430	680,080
Totals....	1,133	10	653,976	998,120	63,330	214,900	781,420	463,360	591,840
1876									
April.....	78	50	43,940	80,370	6,270	15,700	64,670	386,630	480,490
May.....	2	45	979	2,565	.....	.....	.....	269,910	.....
December.	1	20	776	1,800	.....	.....	.....	304,870	.....
Totals....	82	55	45,695	84,735	6,270	15,700	64,670	381,360	499,680
1877									
January..	5	..	2,762	6,840	.....	600	6,240	281,470	308,530
Total.....	5	..	2,762	6,840	.....	600	6,240	281,470	308,530

DUTY OF CORNISH ENGINE, No. 2.

Area of Plunger, 945.6 sq. in. Length of Stroke, 10.5 lin. ft. Load on Engine, 66,000.0 lbs.

MONTH.	Hours and Minutes Worked,		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Backing Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1871									
January ..	309	35	198,601	276,300	15,400	65,230	211,100	498,800	652,860
February ..	599	55	393,055	518,400	7,800	128,748	389,652	526,160	700,010
March	460	..	391,462	538,700	19,100	123,130	415,570	504,280	654,690
April	514	20	332,060	433,900	19,600	93,197	340,703	531,070	676,340
May	127	25	85,853	108,300	1,700	23,457	84,843	550,110	702,210
June	613	..	416,584	533,500	7,500	72,122	461,378	541,870	628,020
July	582	..	388,349	512,600	12,400	64,766	447,834	525,740	601,770
August	593	..	393,238	531,130	10,100	59,858	471,272	513,780	579,050
September ..	320	10	275,457	377,200	6,900	48,135	329,065	506,770	580,900
October	198	20	118,322	155,800	600	23,591	132,309	527,020	600,590
November ..	264	30	163,239	224,100	5,700	37,341	186,759	505,480	606,550
December ..	732	45	462,976	605,900	700	91,215	514,685	530,250	624,230
Totals	5,315	..	3,619,196	4,815,830	107,500	830,760	3,985,160	521,510	630,220
1872									
January ..	652	25	406,785	532,700	4,800	79,944	452,756	529,920	623,480
February ..	653	10	417,354	485,500	2,100	87,470	398,030	596,540	727,640
March	747	20	457,280	636,000	1,400	94,500	541,500	498,940	586,020
April	697	45	444,142	600,350	3,000	90,600	509,750	513,380	604,630
May	413	5	259,365	369,150	3,600	65,550	303,600	487,570	592,840
July	263	5	141,830	214,300	8,100	35,600	178,700	459,270	550,770
August ...	1650		8,401	13,500	1,800	3,100			
	550	10	298,174	440,800	7,500	66,800	384,400	468,290	553,450
September ..	628	50	366,517	524,600	9,300	76,100	448,500	484,830	567,100
October	699	20	405,735	575,300	4,000	76,900	498,100	489,670	565,260
November ..	709	50	377,292	576,900	1,200	69,800	507,100	453,840	516,310
December ..	755	55	436,712	611,900	1,700	80,600	531,300	495,270	570,400
Totals	6,787	45	4,019,587	5,580,700	43,500	826,964	4,753,736	499,820	586,770
1873									
January ..	503	30	272,247	428,400	9,000	53,500	374,900	441,000	503,930
February ..	601	..	384,541	561,600	4,500	76,100	488,500	472,640	546,260
March	111	45	67,634	102,900	7,200	15,700	87,200	456,120	538,240
April	109	45	57,662	79,700	17,700	10,800	68,900	502,060	580,760
June	161	45	101,924	145,600	11,037	24,900	120,700	485,780	586,000
July	94	45	57,002	72,893	17,662	13,800	59,093	542,660	669,390
August	191	40	114,404	166,777	18,359	27,400	139,377	476,030	569,610
September ..	66	5	39,460	54,773	12,095	13,800	40,973	499,940	668,320
October	161	35	93,407	126,261	28,025	22,900	103,361	513,380	627,120
November ..	70	10	40,830	89,486	12,980	18,500	70,986	316,630	399,150
December ..	268	40	154,799	235,161	24,682	43,700	191,461	456,800	561,060
Totals	2,340	40	1,383,910	2,066,561	163,240	321,100	1,745,451	464,720	550,210

DUTY OF CORNISH ENGINE, No. 2.

Area of Plunger, 945.6 sq. in. Length of Stroke, 10.5 lin. ft. Load on Engine, 66,090.0 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Banking Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1874									
January ..	70	15	41,982	55,657	11,210	7,800	47,857	523,440	608,760
February ..	160	30	98,001	130,433	8,335	19,300	111,133	521,400	611,950
March	289	45	179,508	234,471	24,920	35,700	198,771	532,500	626,690
April	150	5	90,700	121,400	20,600	26,700	94,700	518,460	664,630
May	96	20	59,360	74,485	12,400	13,600	60,885	53,030	676,560
June	203	50	116,897	164,070	26,220	32,400	131,670	494,420	616,090
July	137	15	85,552	115,525	19,940	23,900	91,625	513,900	647,950
September ..	140	20	88,296	118,185	19,000	28,300	89,885	518,450	681,680
October	269	55	164,818	226,575	37,050	50,400	176,175	504,800	649,210
November ..	189	10	123,478	176,555	31,065	42,000	134,555	485,330	636,820
December ..	20	45	13,118	19,853	2,850	5,700	14,153	458,530	643,200
Totals	1,728	10	1,061,710	1,437,209	213,590	285,800	1,151,409	512,640	639,880
1875									
February ..	174	5	107,888	149,630	16,530	32,400	117,230	500,360	638,640
March	46	20	30,367	42,460	2,565	9,100	33,360	496,300	631,690
April	66	10	40,397	55,860	8,295	12,200	41,660	501,850	642,080
May	453	55	270,992	400,490	15,390	85,100	315,490	469,560	596,070
June	47	15	33,366	53,580	7,210	13,000	40,580	436,030	575,710
July	142	10	84,342	110,485	19,665	26,300	84,185	529,740	695,240
August	29	25	16,662	21,295	4,655	4,900	16,395	542,970	705,250
September ..	400	35	237,528	337,185	31,925	62,600	274,585	488,850	600,290
October	330	10	197,367	288,520	36,195	58,600	229,920	474,710	595,690
November ..	309	35	186,208	283,290	16,815	56,610	226,680	456,130	570,050
Totals	1,999	40	1,205,417	1,742,795	159,240	360,710	1,382,085	479,970	605,240
1876									
January ..	399	45	191,530	270,750	41,610	59,800	210,950	490,900	630,060
February ..	215	5	125,710	185,820	31,635	40,800	145,020	469,490	601,540
March	376	15	214,794	327,770	40,470	63,100	264,670	454,760	563,170
April	41	40	24,542	36,201	4,700	6,800	29,401	470,450	579,200
May	82	15	45,871	69,830	14,330	15,900	53,930	455,850	590,110
June	159	5	108,281	157,695	14,405	32,800	124,895	476,500	601,630
July	4	10	2,485	2,565	855	400	2,165	672,300	796,510
August	165	10	96,627	148,290	15,785	25,000	123,290	452,180	543,870
September ..	350	5	228,066	315,495	23,655	51,200	264,295	500,490	598,820
October	137	35	80,181	102,345	32,490	19,000	83,345	543,660	667,600
November ..	353	40	205,033	287,410	36,765	44,100	243,310	495,050	584,780
December ..	517	55	301,148	427,315	11,970	63,400	363,915	489,050	574,260
Totals	2,802	40	1,624,268	2,331,486	268,670	422,300	1,909,186	483,450	590,380

DUTY OF CORNISH ENGINE, No. 2.

Area of Plunger, 945.6 sq. in. Length of Stroke, 10.5 lin. ft. Load on Engine, 66,090.0 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Banking Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1877									
January ..	85	55	50,269	70,263	6,270	9,400	60,863	490,130	565,830
February .	592	20	349,202	472,530	13,680	79,800	392,730	506,272	609,140
March	541	05	317,990	475,455	27,075	81,000	394,555	458,090	552,130
April	34	40	20,711	32,490	14,015	5,800	26,690	436,700	531,600
May	205	10	115,850	162,323	22,230	28,900	133,423	488,940	594,840
June	137	40	80,181	107,933	33,345	19,500	88,433	508,930	621,150
July	451	21	262,318	381,900	34,770	53,450	328,450	470,560	547,140
August ...	260		148,864	191,040	34,470	35,800	155,240	533,830	656,940
September	112	52	69,041	82,725	23,370	18,600	64,125	571,750	739,290
October ...	67	05	41,391	57,760	19,095	11,500	46,260	490,930	612,970
November	184	15	103,037	156,525	41,895	29,700	126,825	554,810	684,740
December.	111	40	67,945	91,865	27,360	15,700	76,165	506,690	611,140
Totals	2,781	31	1,626,799	2,282,909	297,575	389,150	1,893,759	488,180	588,500

DUTY OF CORNISH ENGINE, No. 3.

Area of Plunger, 1,018.0 sq. in. Length of Stroke, 10.4 in. ft. Load on Engine, 71,250.0 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Banking Fires.	Pounds of Ashes and Clunkers.	Pounds of Combustible.	DUTY.	DUTY.		
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.		
1871											
January ..	70	40	41,682	65,100	9,200	20,570	44,530	471,250	688,940		
May	541	10	300,881	480,900	3,900	84,295	396,605	460,490	558,370		
August	25	55	14,553	32,600	.....	6,850	25,750	328,560	415,970	
September ..	232	..	127,282	227,000	4,500	31,846	195,154	412,690	480,040		
October.....	490	20	268,708	445,500	2,500	63,943	381,557	443,930	518,330		
November ..	475	40	267,213	467,400	3,800	68,707	398,693	420,780	493,290		
Totals	1,835	45	1,020,319	1,718,500	23,900	276,211	1,442,289	436,980	520,670		
1872											
May.....	197	35	107,616	181,500	8,500	29,400	152,100	436,400	520,750		
June	669	40	393,377	5-9,150	7,500	107,300	481,850	491,440	600,870		
July.....	608	15	369,704	547,900	10,400	87,200	460,700	496,640	590,640		
August	505	50	283,389	430,900	12,900	68,700	362,200	484,070	575,860		
September ..	252	55	139,761	210,400	14,000	33,000	177,400	488,910	579,850		
October.....	51	30	28,119	40,900	3,000	6,800	34,100	506,010	606,920		
December..	78	25	33,906	69,000	7,200	8,900	60,100	361,670	415,230		
Totals	2,364	10	1,355,872	2,069,750	63,500	341,300	1,728,450	482,150	577,360		
1873											
January ..	67	45	31,030	64,000	4,100	9,900	54,100	356,850	422,150		
February..	37	30	36,726	71,000	900	8,500	62,500	380,720	432,490		
March.....	262	15	148,656	237,100	28,800	43,200	193,900	461,460	564,270		
April	394	45	246,481	360,500	24,300	49,000	311,500	503,230	582,390		
May	285	55	187,318	266,800	27,900	45,900	220,900	516,750	624,120		
June	45	40	27,903	44,000	14,900	11,400	32,600	466,750	629,970		
July.....	37	25	22,977	33,729	2,950	6,900	26,829	501,390	630,340		
August ...	361	30	227,432	326,531	29,775	61,600	264,931	512,640	631,840		
September ..	310	20	184,500	265,191	24,692	49,000	216,191	512,060	624,120		
October.....	344	55	208,352	305,431	23,010	51,900	253,531	502,080	604,860		
November ..	7	30	5,012	7,670	2,360	1,700	5,970	490,550	630,230		
Totals	2,155	30	1,326,387	1,981,952	183,687	339,000	1,642,952	492,560	594,200		
1874											
January ..	275	20	164,150	229,874	11,500	40,600	189,274	525,580	638,320		
February..	418	..	290,560	432,844	5,555	73,900	358,944	494,070	595,790		
March.....	512	10	309,689	457,803	18,440	78,500	379,303	497,890	600,930		
April	349	15	209,515	303,500	24,600	58,900	244,600	508,090	630,440		
May	{	368	10	218,162	310,280	31,650	55,100	{	258,993	518,100	631,930
		7	5	4,205	5,613	870	1,800				
June		310	35	186,885	287,768	17,680	52,100		235,668	477,990	583,660
July.....		131	15	78,498	119,445	20,820	30,400		89,045	483,700	648,840
August ..		370	50	217,492	347,085	39,050	71,400		275,685	461,200	580,650
September ..		147	35	89,325	140,110	8,550	31,400		108,710	469,230	604,770
November ..		47	30	27,758	48,735	6,555	10,800		37,935	419,210	538,560
December..		298	5	177,353	284,609	30,680	61,900		222,709	458,640	586,120
Totals		3,235	50	1,973,592	2,967,666	215,950	566,800		2,400,866	489,470	605,030

DUTY OF CORNISH ENGINE, No. 3.

Area of Plunger, 1,018.0 sq. in. Length of Stroke, 10.4 lin. ft. Load on Engine, 71,250.0 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Baking Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1875									
January ..	681	35	350,578	511,017	12,540	168,000	373,017	476,930	691,740
February ..	466	50	267,249	347,945	7,840	77,500	270,445	565,320	727,310
March	345	55	214,054	314,950	20,805	47,400	267,550	500,230	588,850
April	587	55	370,513	526,850	6,665	106,500	420,350	517,610	648,750
May	138	20	84,979	123,405	5,555	25,600	97,805	506,830	639,490
June	323	40	196,681	281,200	35,625	71,385	209,815	514,790	689,940
July	240	25	147,204	211,755	24,795	48,400	163,355	511,650	663,240
August	305	30	190,126	249,067	45,060	65,800	183,267	561,840	763,550
September ..	424	35	308,580	422,505	17,100	80,700	341,805	537,550	664,470
October	372	40	230,996	345,965	12,825	61,700	274,265	506,050	619,900
November ..	487	45	302,749	454,955	28,500	88,600	366,355	489,780	608,230
December ..	393	10	242,322	380,714	40,725	79,500	301,214	468,470	592,110
Totals	4,831	20	2,906,031	4,190,328	258,035	921,085	3,269,243	510,430	654,240
1876									
January ..	59	15	36,425	55,005	7,410	11,700	43,305	487,400	619,080
February ..	154	40	91,151	152,930	10,620	30,200	122,730	438,690	546,650
March	510	20	296,705	457,690	13,395	77,900	379,790	477,130	575,000
April	274	44	174,366	258,780	32,490	53,100	205,680	495,930	623,960
May	403	45	242,532	387,570	41,025	76,600	310,970	460,580	574,030
June	480	45	296,758	418,130	40,475	77,600	340,530	522,370	641,400
July	452	25	286,568	411,947	42,760	59,300	352,647	512,000	598,100
August	502	15	316,086	456,315	36,340	73,200	383,115	509,820	607,230
September ..	568	23	358,092	533,835	28,500	80,400	453,435	493,710	581,250
October	124	55	77,830	110,570	29,405	20,000	90,570	518,080	632,480
November ..	634	30	389,857	526,685	4,845	80,900	445,785	544,800	643,670
December ..	705	35	429,350	592,955	2,850	89,600	503,355	532,940	627,800
Totals	4,871	32	2,995,720	4,362,412	290,115	730,500	3,631,912	505,430	607,090
1877									
January ..	449	15	341,224	472,270	37,335	89,200	383,000	524,370	646,480
February ..	665	10	401,769	544,765	855	91,300	453,465	535,240	643,020
March	731	30	443,706	656,795	2,565	110,700	546,095	490,300	589,680
April	207	35	125,582	188,655	39,615	35,300	153,355	484,270	595,740
May	369	..	224,226	324,045	32,205	54,000	270,045	502,230	602,070
June	133	55	82,251	116,415	29,070	21,000	95,415	512,760	625,630
July	490	59	296,310	445,230	7,125	60,500	384,730	483,010	558,960
August	277	50	164,125	237,995	20,520	40,200	197,795	500,500	602,210
September ..	132	30	89,996	125,972	35,625	25,600	100,372	518,490	650,730
October	160	25	110,312	169,305	47,025	32,300	137,005	472,870	584,360
November ..	38	15	21,971	35,565	12,825	6,200	29,365	367,500	543,020
December ..	146	45	91,779	147,260	34,570	24,500	122,760	452,330	542,600
Totals	3,803	9	2,393,251	3,464,272	299,335	590,800	2,873,472	501,380	604,470

DUTY OF DUPLEX ENGINE, No. 4.

Area of Plunger, 609.5 sq. in.

Length of Stroke, 16.5 in. ft,

Load on Engine, 42,665 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Banking Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1873									
January.	297	20	207,326	266,850	13,800	51,400	215,450	547,000	677,499
February	55	..	38,009	47,100	.....	7,500	39,600	568,150	675,750
March...	525	20	376,561	448,600	15,300	82,000	366,600	590,980	723,170
April.....	329	20	243,324	305,400	14,600	54,300	251,100	560,934	682,240
May.....	475	20	357,989	412,200	20,700	77,200	335,000	611,444	752,350
June.....	511	45	406,931	461,772	13,464	84,600	377,172	620,424	759,590
July.....	669	10	523,102	572,289	10,044	96,000	476,289	643,530	773,230
August...	326	40	245,034	272,285	15,050	5,000	222,285	633,580	776,090
Sept.	49	15	362,218	397,652	26,203	67,900	329,752	641,303	773,360
October.	377	50	266,881	303,157	10,625	47,800	255,357	619,790	735,810
Nov.	568	45	432,224	486,407	15,050	72,900	413,507	625,611	735,907
Dec.	449	10	419,379	487,242	15,340	71,000	416,242	605,980	709,345
Totals..	5,080	55	3,878,978	4,460,954	169,176	762,600	3,698,354	612,190	738,422
1874									
January.	515	25	371,128	437,585	10,640	61,400	376,185	597,120	694,575
February	300	..	207,798	251,340	8,930	38,200	213,140	582,070	686,397
March....	189	30	134,578	153,640	13,265	26,000	127,640	616,690	742,310
April.....	386	55	270,099	301,530	9,000	51,800	249,730	630,650	761,460
May.....	428	30	299,922	350,715	11,835	58,900	291,815	602,080	723,600
June.....	441	40	310,522	366,790	9,440	69,500	297,290	596,040	735,370
July.....	695	45	492,506	595,290	8,550	137,900	457,390	582,477	758,093
August...	594	26	427,779	520,225	18,810	109,000	411,225	578,930	732,383
Sept.	631	55	453,545	565,335	11,700	117,600	447,735	564,830	713,672
October..	636	20	441,770	567,965	13,965	117,400	450,565	547,610	690,298
Nov.	610	10	419,616	529,110	15,960	102,900	426,210	558,340	693,150
Dec.	675	40	465,223	595,965	10,605	120,600	375,365	549,590	872,577
Totals...	6,106	16	4,294,486	5,235,490	142,700	1,011,200	4,124,290	577,500	733,100
1875									
January.	620	15	422,012	557,460	11,500	119,400	438,060	532,980	678,250
February	510	30	419,755	573,655	8,835	117,200	456,455	515,160	647,430
March....	719	15	485,356	672,415	5,130	129,100	543,315	508,190	628,940
April.....	79	55	55,131	74,955	855	13,500	61,455	517,840	631,590
May.....	186	30	129,325	174,135	7,980	35,900	138,235	522,870	658,660
June.....	584	..	383,468	522,390	8,265	10,600	511,790	523,550	534,390
July.....	649	55	438,450	585,527	14,535	11,400	574,127	527,195	537,660
August...	667	30	452,589	615,170	12,255	11,380	603,790	517,970	527,730
Sept.	175	30	127,136	176,130	4,275	27,400	148,730	508,200	601,820
October..	348	35	229,528	311,776	3,990	45,051	266,725	518,315	605,851
Nov.	264	20	180,288	251,655	20,900	42,300	209,355	504,376	606,286
Dec.	686	25	497,352	672,885	11,970	117,300	555,585	520,374	630,244
Totals...	5,492	40	3,825,390	5,188,153	110,490	680,531	4,507,622	519,107	597,485

DUTY OF DUPLEX ENGINE, No. 4.

Area of Plunger, 609.5 sq. in.

Length of Stroke, 16.5 lin. ft.

Load on Engine, 42,665 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Banking Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1876									
January ..	642	20	478,444	647,698	14,525	101,800	545,898	520,057	617,050
February ..	657	25	481,366	648,970	6,840	108,600	540,370	522,220	627,165
March	254	30	181,504	261,345	3,705	41,600	219,745	488,952	581,517
April	535	35	393,794	541,975	19,380	100,100	441,875	511,553	627,433
May	545	30	383,949	514,015	16,800	89,100	424,915	525,888	636,165
June	563	45	313,482	424,650	15,660	58,155	366,495	519,731	602,200
July	731	35	507,102	670,330	2,565	81,600	588,730	532,600	606,425
August ...	505	25	346,454	463,125	2,850	62,900	400,225	526,680	609,450
September	177	35	121,911	170,145	10,835	24,500	145,645	504,455	589,308
October ...	744	..	538,030	760,665	.....	98,200	662,465	497,980	571,795
November	104	..	71,962	106,020	285	14,300	91,720	477,873	552,380
December.	49	..	35,660	43,130	5,320	7,300	35,830	582,100	700,690
Totals	5,510	40	3,853,658	5,252,068	98,765	788,155	4,463,913	516,580	607,790
1877									
January ..	634	25	490,257	652,050	6,900	81,500	570,550	521,730	596,260
April	659	50	510,965	706,230	5,700	104,600	601,630	502,050	589,340
May	492	..	374,056	471,860	5,130	64,200	407,660	550,084	636,709
June	720	..	550,532	674,885	0,000	91,400	583,485	566,053	656,230
July	258	30	180,471	222,870	6,080	29,300	193,570	563,190	646,966
August ...	557	30	429,282	543,775	4,275	71,800	471,975	547,678	631,145
September	228	15	181,815	220,875	0,000	31,000	189,875	572,520	664,460
October...	393	45	307,158	389,450	6,555	61,000	328,450	547,280	648,926
November	70	55	52,775	67,945	570	9,700	58,245	538,986	628,750
December.	544	25	406,350	499,370	5,130	57,165	442,205	564,660	637,650
Totals	4,559	35	3,483,661	4,449,310	63,135	601,665	3,847,645	543,310	628,264

DUTY OF DUPLEX ENGINE, No. 5.

Area of Plunger, 609.5 sq. in.

Length of Stroke, 16.5 lin. ft.

Load on Engine, 42,665 lbs.

MONTH.	Hours and Minutes Worked.		Number of Strokes made by Engine.	Pounds of Coal Consumed while Pumping.	Pounds of Coal for Banking Fires.	Pounds of Ashes and Clinkers.	Pounds of Combustible.	DUTY.	DUTY.
	H.	M.						Foot lbs. for one lb. of Coal.	Foot lbs. for one lb. of Combustible.
1877									
September	488	..	372,466	475,525	5,130	64,500	411,025	543,520	628,810
October...	302	30	236,790	300,555	570	38,500	262,055	546,690	629,413
November	636	55	471,284	580,255	23,505	50,559	529,696	563,600	618,810
December.	117	..	120,608	148,200	0,000	16,668	93,386	561,588	634,140
Totals....	1,546	25	1,205,708	1,510,235	29,205	170,227	1,296,162	553,450	626,600

**Record of Engines in Pounds of Combustible per Horse-
Power per Hour.**

NUMBER AND KIND OF ENGINE.	YEAR.	No. lbs. of Combustible per H. P. per hour.
Cornish Engine, No. 1.....	1871	3,2,290
“ “ “ 1.....	1872	3,1,396
“ “ “ 1.....	1873	3,4,556
“ “ “ 1.....	1875	3,3,455
“ “ “ 1.....	1876	3,9,625
“ “ “ 1.....	1877	6,41
Cornish Engine, No. 2.....	1871	3,1,418
“ “ “ 2.....	1872	3,3,744
“ “ “ 2.....	1873	3,5,987
“ “ “ 2.....	1874	3,0,943
“ “ “ 2.....	1875	3,2,714
“ “ “ 2.....	1876	3,3,538
“ “ “ 2.....	1877	3,37
Cornish Engine, No. 3.....	1871	3,8,028
“ “ “ 3.....	1872	3,4,294
“ “ “ 3.....	1873	3,3,322
“ “ “ 3.....	1874	3,2,726
“ “ “ 3.....	1875	3,0,264
“ “ “ 3.....	1876	3,2,615
“ “ “ 3.....	1877	3,28
Duplex Engine, No. 4.....	1873	2,6,546
“ “ “ 4.....	1874	2,6,739
“ “ “ 4.....	1875	3,2,808
“ “ “ 4.....	1876	3,2,251
“ “ “ 4.....	1877	3,12
Duplex Engine, No. 5.....	1877	3,13

W. A. B. A. I. B. A. I.

**AVERAGE DAILY AND ANNUAL CONSUMPTION OF WATER FOR
TWENTY YEARS.**

YEAR ENDING	Daily Average. Cubic Feet.	Annual Consumption. Cubic Feet.	Percentage of Increase.
July.....1858	188,666	68,863,050	.....
".....1859	230,684	84,199,813	.22379
".....1860	267,992	97,817,062	.16173
".....1861	288,872	105,438,394	.07791
".....1862	308,445	112,582,478	.06775
".....1863	340,344	124,225,867	.10342
".....1864	406,127	148,236,333	.19328
".....1865	478,385	174,610,667	.17792
".....1866	540,307	197,212,222	.12944
".....1867	573,276	209,246,015	.06101
".....1868	628,001	229,220,661	.09546
January.....1870*	810,665	295,892,887	.29086
".....1871	923,323	337,014,354	.13897
".....1872	1,036,407	378,288,541	.12247
".....1873	1,279,307	468,226,403	.23437
".....1874	1,485,777	542,308,474	.15822
".....1875	1,393,182	508,511,574	.06233†
".....1876	1,625,958	593,484,627	.16907
".....1877	1,649,487	602,062,909	.01108
".....1878	1,742,746	636,102,454	.05654

*Eighteen months.

The measured water account for the year commencing Nov. 1st, 1876, and ending Nov. 1st, 1877, shows a consumption of 170,200,-000 cubic feet, including Hoboken.

The population of Jersey City and Hoboken, as given by the census of 1875 is 134,000.

I estimate the population not supplied with Passaic water at 14,000, leaving 120,000 using water, or at the rate of 10.64 cubic feet per head per diem.

Mr. Kearney, the Chief Engineer of the pumping works at Belleville, reports, under date of Dec. 24th, 1877, that the engines, boilers, pipes and grounds at Belleville are generally in good order and condition, except that Cornish Engine No. 1 will require some alterations in the arrangement of the valve chamber, before it can be made to perform satisfactory duty, and that the foundation of Cornish Engine No. 3 is not good, although the engine has been working regularly during the year. An alteration has been recently made in the overflow from the air pump of this engine, enabling the discharge of about 17,000 pounds from the weight box. A new set of valves have been designed for the engine by the use of rubber disks in the place of the present metallic valves, in the application of which it is expected that the engine will be relieved from the severe shock at the end of each stroke of the plunger.

Mr. Kearney reports that the following repairs and renewal of certain parts of the machinery will be soon required.

For Cornish Engine No. 2, new cylinder cover, piston rings and follower.

For Duplex Engine No. 4, new pistons for the low pressure cylinders. He also recommends the following betterments and repairs to the works, in all of which I endorse his opinion. The bottom of the river should be cleaned out and deepened immediately around the mouth of the conduit. The smoke stack of the Cornish boilers should be extended 25 or 30 feet in height. A stairway should be constructed in the stand-pipe tower. The roof of the coal bunkers is in a very leaky condition, and should be renewed. The oil house should be increased to about double its present capacity, and a cesspool constructed for the drainage of the sink and refuse water flowing from all the dwelling houses situated upon the grounds of the water works, which are now occupied by the employees.

The pipe lines between Reservoirs Nos. 1 and 2 have needed but little repairs during the year, and but one serious break has occurred, which happened on the morning of the eleventh of July last. It was occasioned by the giving out of a length of the 36 inch main in St. Pauls avenue, near Nelson avenue, on the westerly slope of the hill. A new length was inserted and the pipe in operation again in 24 hours after the break was discovered.

Reservoir No. 2 has never been thoroughly cleaned since the beginning of its use, over 20 years ago, and I cannot too earnestly recommend that some means should be provided for the completion of the southern portion of Reservoir No. 3 for that purpose, as well as for storage.

The 20-inch supply main from Reservoir No. 1 has been connected with the 12-inch distribution main in Summit avenue, and the gate in connection with Reservoir No. 2 closed, so that all of that portion of old Hudson City lying south of Laidlow Avenue, and south and west of Reservoir No. 2 is now supplied without the use of the High Service pumps.

A thorough survey and examination of the location and dimensions of all the distributing pipes and the stop cocks and hydrants connected therewith, has been in progress during the latter half of the year and is now nearly completed.

There are many serious and annoying defects in the grade plans of the city.

The grades of many of the streets were changed by the authorities of the several municipalities before consolidation, without a corresponding change being made in the grades of the intersecting streets. The case of Nelson avenue, in the Hudson City district, the grade of which was changed for about a half a mile of its length, being one of many instances. Also, there are many cases where the grades of streets, which have been fully regulated and extensively built upon, do not agree with the established grade as recorded, and there are several cases in which there are no established grades for streets that are quite largely built upon.

The grade maps therefore need a thorough revision, and perhaps some legislation will be necessary to provide for the making of a complete and harmonious system of grades. The subject of proper sewerage of Jersey City seems to have occupied the attention of the former superintendents of the water works, and it is a subject of more than ordinary importance.

I find in a report made by Wm. S. Whitwell, the first engineer, to the Board of Water Commissionors of Jersey City, dated April 11th, 1853, the following language: "Pumping out the sewage matter by steam power has been strongly recommended by the Board of Health, in their reports of 1850 and 1852, for the relief of the low districts of London, but their efforts for its introduction have not yet proved successful." And further on: "It is without doubt the plan most applicable to many low places, when the requisite fall and quantity of water cannot be obtained, and in such place *its perfect efficiency must ensure its adoption*; but from the peculiar situation of Jersey City, where a canal can be constructed through unoccupied ground at a very small expense, serving the double purpose of navigation, and of cleaning out the sewers, the above reasons do not apply with the same force. It has therefore been deemed unnecessary to go into details and calculations for its illustration."

That a navigable canal, or, in fact, any canal or receptacle for water, for the purpose of flushing the sewers, will ever be constructed around Jersey City, is very improbable, not to say impossible. And that the present system, or more properly, want of system of sewerage in old Jersey City is a serious blot upon the welfare and health of the citizens, cannot be denied by any person who has or will carefully consider the subject.

The sewers all lie between low and high tide at their mouths, and every high tide rises above the opening at the mouth of each.

The natural result is that the sewer gases are forced back by the rising tide, to find their escape where best they can, either through the manhole plates into the street, or through defective traps, into our houses.

It seems to me, therefore, of the utmost importance that some measures should be taken to provide for designing and carrying out a plan of sewerage that will be effectual. Of the fact that it can be done by means of steam pumps, I am thoroughly convinced, and at a reasonable expense; in support of which I state the fact that the Drainage Commissioners of Hoboken, in September, 1874, received a proposition from a well-known and responsible firm in New York to erect the necessary boilers and machinery, exclusive of foundation, to lift $28\frac{1}{2}$ million gallons of water 15 feet high in 24 hours for the sum of \$11,100.00.

And again bids were received by the Mayor and Council of Hoboken, in July, 1876, from responsible parties, who offered to contract for twenty years to keep the water in a receiving well for all sewers that might be constructed in a territory comprising about 2,500 lots, down to a level of 10 feet below high water, for \$5.00 per lot per annum.

"A."—CAST-IRON WATER PIPE LAID DURING YEAR ENDING DECEMBER 31, 1877.

NOTE.—H.C. means "Old Hudson City." J.C. means "Old Bergen." B. means "Old Bergen."

DIST.	NAME OF STREET.	LENGTH OF PIPE IN FEET.					HYDRANTS.	NUMBER AND SIZE OF GATES.			
		4 in.	6 in.	10 in.	12 in.	30 in.		6 in.	10 in.	12 in.	12 in.
H.C.	Peterson street, from Pierce avenue to Central avenue.....	21	960	.....	.....	.....	3	1	.....	.....	.....
H.C.	Claremont avenue, from Jackson avenue towards Bergen.....	7	491	.....	.....	.....	1	2	.....	.....	.....
H.C.	Lewis street, from St. Paul's avenue, "North".....	14	553	.....	.....	.....	1	1	.....	.....	.....
H.C.	Van Wagener avenue, from St. Paul's avenue, "North".....	7	343	.....	.....	.....	1	1	.....	.....	.....
H.C.	St. Paul's avenue, from Summit avenue towards Huron.....	14	732	.....	.....	.....	2	1	.....	.....	.....
H.C.	Zabriskie street, from Central avenue to Summit avenue.....	14	678	.....	.....	.....	2	1	.....	.....	.....
J.C.	Washington street, from Dudley street, "South".....	7	992	.....	.....	.....	1	.....	.....	.....	.....
H.C.	Summit avenue, from Lincoln street to Zabriskie street.....	7	527	.....	.....	.....	1	2	.....	.....	.....
H.C.	Hancock avenue, from South street, "North".....	7	942	.....	.....	.....	1	.....	.....	.....	.....
H.C.	Webster avenue, from South street towards Bowers street.....	14	413	.....	.....	.....	2	1	.....	.....	.....
H.C.	Congress street, from Central avenue to Palisade avenue.....	14	1,290	.....	.....	.....	2	2	.....	.....	.....
H.C.	Graham avenue, from Central to Durham avenues.....	35	1,315	.....	.....	.....	5	1	.....	.....	.....
H.C.	Waller avenue, from Summit avenue, "West".....	7	297	.....	.....	.....	1	1	.....	.....	.....
H.C.	Webster avenue, from North to South streets.....	21	1,313	.....	.....	.....	3	1	.....	.....	.....
B.	West Side avenue, from Gifford street, "West".....	7	144	.....	.....	.....	1	.....	.....	.....	.....
J.C.	Eleventh street, from Erie street towards Jersey avenue.....	14	350	.....	.....	.....	2	.....	.....	.....	.....
J.C.	Thirteenth street, from Grove to Henderson street.....	7	944	.....	.....	.....	1	.....	.....	.....	.....
H.C.	Zabriskie street, from Summit avenue to Nelson avenue.....	28	1,330	.....	.....	.....	4	2	.....	.....	.....
H.C.	Nelson avenue, from Zabriskie street to Griffith street.....	.....	262	.....	.....	.....	.....	.....	.....	.....	.....
H.C.	Concord street, at St. Paul's avenue, "East".....	49	68	.....	.....	.....	.....	.....	.....	.....	.....
H.C.	Bleeker street, from Nelson avenue to Central avenue.....	.....	1,798	.....	.....	.....	7	1	.....	.....	.....
H.C.	Summit street, from Lincoln to Thorn streets.....	14	744	.....	.....	.....	2	1	.....	.....	.....
B.	Whitmore place, from Communipaw avenue, "South".....	.....	314	.....	.....	.....	.....	.....	.....	.....	.....
H.C.	Van Horn street, from Halladay street to Railroad avenue.....	21	538	.....	.....	.....	3	1	.....	.....	.....
B.	Bramhall avenue, from Halladay street to Van Horn avenue.....	.....	929	.....	.....	.....	.....	.....	.....	.....	.....
H.C.	Nelson avenue, from Zabriskie street to Hunton street.....	7	396	.....	.....	.....	1	1	.....	.....	.....
H.C.	Boorstein avenue, from Webster avenue towards Palisade.....	7	345	.....	.....	.....	1	1	.....	.....	.....
J.C.	Brunswick street, from Webster avenue to Sherman avenue.....	7	786	.....	.....	.....	1	2	.....	.....	.....
H.C.	Palisade street, from Sherman avenue to Palisade avenue.....	7	733	.....	.....	.....	1	2	.....	.....	.....
H.C.	Palisade avenue, from Jefferson avenue to Waverly street.....	.....	265	.....	.....	.....	.....	.....	.....	.....	.....
H.C.	Willow Court, between Newark and Pavonia avenues.....	.....	12	.....	.....	.....	.....	.....	.....	.....	.....
H.C.	Connections at Engine House, High Service Works.....	.....	44	.....	.....	.....	.....	2	.....	.....	.....
H.C.	Reservoir No. 2, "connections".....	.....	80	.....	.....	.....	.....	2	.....	.....	.....
H.C.	Troy street, from Summit avenue, "West".....	14	285	.....	.....	.....	.....	1	.....	.....	.....
H.C.	Bergen avenue, from Myrtle avenue, "South".....	35	1,815	.....	.....	.....	5	.....	.....	.....	.....
Totals.....		439	19,290	1,815	80	100	60	34	2	1	.....
RELAI'D PIPE.											
H.C.	Magnolia avenue, from Summit avenue, "West".....	21	535	.....	.....	.....	3	1	.....	.....	.....
J.C.	Wayne street, "East and West" of Colgate street.....	14	579	.....	.....	.....	2	1	.....	.....	.....
J.C.	Colgate street, at Wayne street.....	.....	43	.....	.....	.....	.....	.....	.....	.....	.....
Total Pipe laid during year.....		474	20,747	1,815	80	100	65	36	2	1	.....

"C."—STATEMENT OF PIPE WORK CONNECTED WITH THE JERSEY CITY WATER WORKS TO DECEMBER 31, 1877.

	36 inch.	30 inch.	24 inch.	20 inch.	16 inch.	12 inch.	10 inch.	8 inch.	6 inch.	4 inch.	3 inch and less.	TOTAL.
Pipe laid to Dec. 31, 1876, as per Chief Engineer's Report.	67,458	45	3,500	44,567	96,993	39,806	9,861	94,905	371,553	98,939	6,083	632,356
Pipe laid during 1877 . . .	.....	.....	.....	100	.....	80	1,815	.....	19,990	439	.....	21,794
Totals.....	67,458	45	3,500	44,667	96,993	39,886	11,666	94,905	390,848	99,371	6,083	654,080
Total pipe laid in Hoboken.....	.....	.....	.....	.....	3,790	15,025	.....	.....	57,578	3,939	693	80,178

"D."—HYDRANTS SET UP TO DECEMBER 31, 1877.

	JERSEY CITY.	HOBOKEN.	TOTAL.
Set prior to December 31, 1876, as per Chief Engineer's Report.....	1,143	106	1,248
" " " " 1877	65	10	75
Total.....	1,208	115	1,323

G A T H S.

	36 inch.	30 inch.	24 inch.	20 inch.	16 inch.	12 inch.	10 inch.	8 inch.	6 inch.	4 inch.	3 inch.	TOTAL.
Set prior to December 31, 1876... as per Chief Engineer's Report.	31	1	2	6	19	24	68	14	21	35	41	964
Set during 1877.....	.....	.....	.....	.....	.....	.....	1	2	.....	.....	.....	30
Totals.....	31	1	2	6	19	24	69	16	21	35	41	993
Total set in Hoboken.....	.....	.....	.....	.....	.....	5	21	.....	96	9	.....	131

TAPS INSERTED FOR SERVICE PIPES DURING THE YEAR 1877.

$\frac{3}{8}$ inch.	$\frac{1}{2}$ inch.	$\frac{3}{4}$ inch.	$\frac{7}{8}$ inch.	1 inch.	1 $\frac{1}{2}$ inch.	2 inch.	4 inch.	TOTAL.
438	102	33	7	3	2	0	1	586

HOUSE CONNECTIONS TO SEWERS DURING THE YEAR 1877.

6 inch.	8 inch.	9 inch.	12 inch.	TOTAL.
201	25	10	2	238

PRIVATE DRAINS.

12 inch.	10 inch.	6 inch.	TOTAL.
6	1	14	21

SCHEDULE OF TAPS ON HAND DECEMBER 31, 1877.

DIAMETER IN INCHES.	$\frac{1}{8}$ in.	$\frac{1}{4}$ in.	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	1 $\frac{1}{2}$ in.	1 $\frac{3}{4}$ in.	2 in.
Number of Taps for Iron Pipe.....	138	22	38	20	42	16	24	5
“ Nipples for Cement Pipe.....	108	150	.....	.....	.....	.....	.....	.....
Solder for Cement Pipe.....	84	169	276	9	.....	.....	2	.....
	330	341	314	29	42	16	26	5

SCHEDULE OF WATER METERS ON HAND AT PIPE YARD .
DECEMBER 31, 1877.

DIAMETER IN INCHES.	$\frac{1}{4}$ inch.	1 inch.	2 inch.	3 inch.	4 inch.
Number on hand in good order.....	2	-----	-----	1	1
Number on hand not in order.....	28	2	3	1	3
	30	2	3	2	4

SCHEDULE OF WATER METERS IN USE DECEMBER 31, 1877.

DIAMETER IN INCHES	1½ in.	2 in.	3 in.	4 in.	5 in.	6 in.
Number and size in use.....	0	31	49	38	33	16
Number and size in use in City of Hoboken.....	1	23	7	4	10	1
	1	54	56	42	43	17

SCHEDULE OF PIPES AND SPECIAL CASTINGS ON HAND
DECEMBER 31, 1877.

[illegible]

THE following contracts have been awarded by the Board of Public Works, and the work under each completed during the year 1877.

STREETS.

Fairmount avenue (improvement), between Bergen and Monticello avenues.

Hancock avenue (improvement), from north side of Franklin street to a point about 150 feet north of Hutton street.

Warren street (improvement) from Montgomery street to the Pennsylvania R. R.

Highland avenue (improvement), from Bergen avenue to West Side avenue.

Concord street (improvement), from place where now paved to the south side of St. Pauls avenue.

SEWERS.

Bergen and Sip avenues.

Beginning in Webster avenue, at the northern boundary of lot 246, and running through Webster avenue to Griffith street.

At Belleville, from the Cornish engine house to Passaic River.

MISCELLANEOUS.

Furnishing and delivering 400 lengths (12 feet each) of 10-inch cast iron water pipe.

Furnishing and delivering 1000 lengths of 6-inch cast iron water pipe.

Furnishing and delivering 400 lengths of 8-inch cast iron water pipe.

Furnishing and delivering about 6000 tons anthracite coal at Belleville, N. J.

Furnishing steam heating apparatus for School No. 7.

Carting and trimming coal at Belleville.

Improvement of sidewalks and playgrounds at School No. 6.

**CONTRACTS AWARDED PREVIOUS TO JAN. 1st, 1877, AND COMPLETED
DURING THE YEAR.**

STREETS.

Washington street (improvement), from Essex street to East Central avenue.

MISCELLANEOUS.

Building Public School House No. 7.

Building wall and laying flag in yard of School House No. 8.

Building engine and boiler house at Belleville, N. J.

Transporting Duplex engine, and building foundations, etc., for same at Belleville.

**CONTRACTS AWARDED DURING THE YEAR 1877, AND UNCOMPLETED
DEC. 31st, 1877.**

SEWERS.

Sherman avenue, from a point about 30 feet south of Hutton street, to Franklin street, to connect with sewer now built.

Bower street, Central avenue, Hutton street, Webster avenue, Ravine and New York avenues.

Beginning in Ogden avenue, 25 feet south of Liberty street, and running thence through Ogden avenue to Franklin street.

Beginning in Manhattan avenue, 425 feet from Sherman avenue, and running to Sherman avenue.

Beginning in Claremont avenue, about 75 feet east of Bergen avenue, and running through Claremont avenue.

MISCELLANEOUS.

Excavating rock from the water pipe trenches.

Street dirt, garbage, etc., district north of Pennsylvania R. R.

Street dirt, garbage, etc., district south of Pennsylvania R. R.

Furnishing and delivering three Lancashire boilers at Belleville.

Removing sewer refuse material from sewers.

**MISCELLANEOUS WORK DONE BY THE BUREAU OF ENGINEERING
FOR THE YEAR 1877.**

Measuring rock in trench for water pipe in Van Wagener avenue,
north of St. Pauls avenue.

Giving grades for water pipe in Lewis street.

Survey of property corner Central avenue and Congress street,
School No. 7.

Survey of Factory street, at its intersection with the Penn. R. R.
Measured rock in trench for water pipe in St. Pauls avenue, west
of Summit avenue.

Newark avenue, reconstruction from Warren to Henderson street.

Giving grades for paving on Warren street, between First and
Morgan streets.

Giving grades for paving Bay street, between Warren and Provost
streets.

Levels in Hancock avenue for water pipe.

Grades corner York and Green streets.

Measured rock in trench for water pipe in Webster avenue, between
North and South streets.

Grades for water pipe in Van Horn street.

Survey for the extension of Warren street, from the Morris Canal
to West Central avenue.

Survey of Academy street, from the old city line, between Jersey
City and Bergen, to Factory street.

Grades on Montgomery street, between Warren and VanVorst streets.

Levels in cellars corner Central avenue and Griffith street.

Levels on Dwight street, between Washington avenue and the
Morris Canal.

Cross sectioned rock in Pamrapo avenue.

Grades corner Canal and Grove streets for drain pipe.

Survey of street between Ocean avenue and Old Bergen Road, in
Greenville.

Testing water run of sewer in Central avenue, corner Beacon avenue.

Levels on Ocean avenue, between Chestnut and Pearsall avenues.

Measured rock in Graham avenue for water pipe.

Measured sidewalks at School No. 6 and 13.

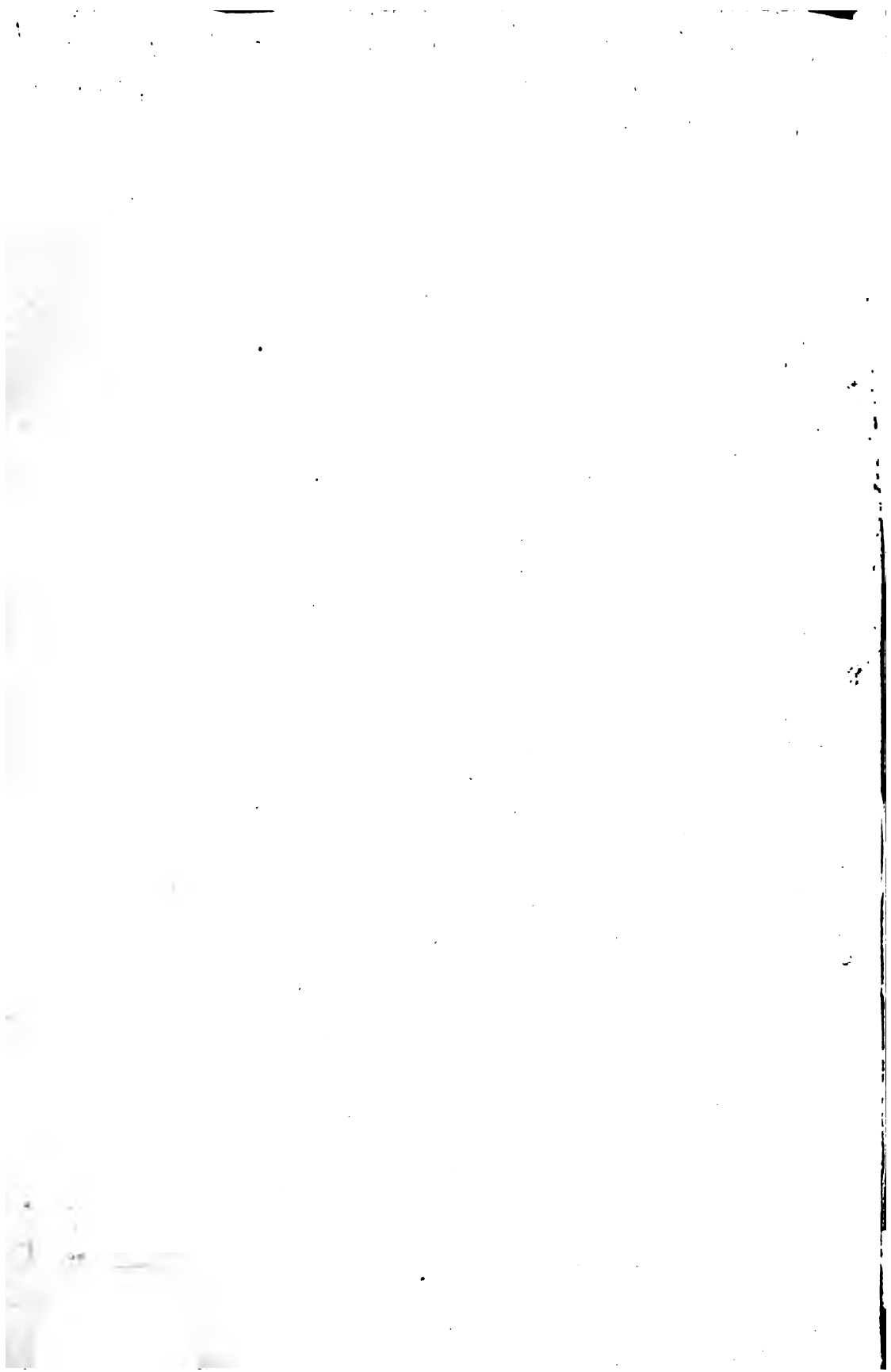
Giving grade on Grand street.

Levels on Henderson street, between Sixth street and the Pa. R. R.
 Levels in Water, Vroom and Summit avenue.
 Reconstruction, Pavonia avenue.
 Reconstruction, Grand street.
 Grade on 18th street.
 Grade on 15th and Grove streets.
 Levels on Warren street, between Morris and Essex streets.
 Levels on Ocean avenue.
 Levels for sewer at Belleville, N. J.
 Measured rock in trench for water pipe in Hutton street and
 Webster avenue.
 Measured paving in Jersey avenue and Montgomery street.
 Levels in Jackson and Virginia avenues for grade maps.
 Stakes for water pipe in Bergen avenue.
 Levels on Brunswick street, between Montgomery street and New-
 ark avenue.

Respectfully submitted,

LEVI W. POST,

Chief Engineer.



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Stockton, Calif.
PAT. JAN. 21, 1908

